Forest Management Herbicide Reference Manual

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Alberta
Sustainable Resource Development

Alberta Sustainable Resource Development
Public Lands and Forests Division
Forest Management Herbicide Reference Manual

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FOREST MANAGEMENT HERBICIDE REFERENCE MANUAL 2003

1. INTRODUCTION

The audience of this manual is Public Lands and Forests Division staff and forest industry personnel.

The purpose of this manual is to ensure Public Lands and Forests Division personnel and industry:

- Are familiar with current Crown land/forest management herbicide use regulations and policies;
- Take an active role in ensuring herbicide use on Crown land is in accordance with policies and requirements;
- Recognize obvious and important violations of provincial legislation governing herbicide use on crown land;
- Are comfortable performing basic herbicide inspections; and
- Are aware of incident reporting mechanisms and follow-up.

Any inquiries regarding the manual content can be directed to the Forest Management Branch, Provincial Herbicide Coordinator at (780) 427-8474.

2. ROLES AND RESPONSIBILITIES

FIGURE 1 Roles and Responsibilities Summary

Forest Company • Obtain herbicide use approval from Public Lands and Forests Division. • Follow content and intent of Forest Management Herbicide Reference Manual. • Identify risks and strategies to mitigate them. • Communicate risks and strategies to applicators.	**Public Lands and Forests Division** • Maintain and update Forest Herbicide Reference Manual. • Review and approve herbicide proposals. • Enforcement through limiting the scale of the Forest Company's herbicide program or withholding approval.
Applicator • Follow content and intent of the *Environmental Code of Practice for Pesticides*. • Maintain a valid Pesticide Service Registration. • Ensure Applicator Certification requirements are met.	**Alberta Environment** • Maintain and update Provincial legislation and policies. • Enforcement through administrative penalties and tickets.

2.1 Alberta Environment

Pesticide management responsibilities are divided between the regional offices of Alberta Environment. The role of Alberta Environment includes:

- Development of standards, policies and programs pertaining to pesticides: anyone applying a pesticide for hire or reward, or on public lands, or for forest management in Alberta must be a certified applicator (or an authorized assistant). Certification, administered by Lakeland College (Vermilion), ensures a standard of competence and understanding in pesticide application.

- Issuing service registrations to companies providing pesticide application services. This assures that only certified applicators will be used, minimum standards of insurance and risk management are met, that emergency response planning and training are in place, and that an individual or firm hiring a pesticide applicator is assured that application services are in compliance with provincial legislation.

- Ensuring regional inspectors are familiar with programs/policies pertaining to pesticides.

- Conducting field inspections and investigations of pesticide incidents.

- Providing interpretation of pesticide product labels, legislation, Codes of Practice and policies.

Alberta Environment staff are responsible for:

- Issuing approvals/registrations under the Alberta Environmental Protection and Enhancement Act.

- Responding to routine public inquiries.

- Responding to public complaints and conducting follow-up enforcement action in the case of violations.

- Inspecting regulated activities on a spot-check basis or as a result of complaints received from forestry personnel or the general public.

Alberta Environment Regional Services Division offices* are as follows:

Location	Phone
Lethbridge	(403) 381-5511
Calgary	(403) 297-8271
Red Deer	(403) 340-5310
Edmonton	(780) 427-7617
Stony Plain	(780) 963-6131
Grande Prairie	(780) 538-5460

*the above offices can be contacted by phoning 310-0000 from anywhere in Alberta.

Pesticide management information may be obtained through the following website:
http://www3.gov.ab.ca/env/protenf/pesticide

2.2 Fish and Wildlife Division

Fish and Wildlife Division's role is to ensure conservation and management of fish and wildlife resources.

Fish and Wildlife Division involvement includes:

- Reviewing and providing suggestions for updating herbicide related land use guidelines.
- Reviewing forest management herbicide plan submissions to ensure that potential impacts on fish and wildlife resources are addressed.

2.3 Public Lands and Forests Division

Public Lands and Forests Division's principal role is to integrate land use activities and ensure the sustained productivity of forest resources. The mandate of the Public Lands and Forests Division is to administer and regulate the application of herbicides according to Provincial policy. The responsibilities of the Public Lands and Forests Division include:

- Policy development regarding where and when herbicides will be used in place of other vegetation management alternatives.
- Review and approval of appropriate forest management herbicide project proposals.
- Audits of representative areas to ensure that herbicide applications are being conducted in accordance with established policies.
- On-site audits while a herbicide application is in progress, to ensure that the

application is being conducted by an approved pesticide service provider under the direct supervision of certified pesticide applicators and that no obvious violations are occurring (i.e. leaks, spills, improper disposal). Any suspected violations would be documented and reported to the regional Alberta Environment inspector for follow-up.

3. LEGISLATION

3.1 Federal Legislation - Pesticide Label Requirements

3.1.1 *Pest Control Products Act* (Canada)

The *Pest Control Products Act* is administered by Health Canada, Pest Management Regulatory Agency. The *Pest Control Products Act* and its regulations cover:

- Registration: The registration process clears pesticides for sale by establishing the effectiveness and safety of pesticide products.
- Labelling: Labels reflect information collected during the registration process and inform users regarding the proper use and handling of each pesticide product.
- Classification: Pesticides are placed in one of three federal use categories: Restricted; Commercial, (including Agricultural, Forestry, or Industrial), or Domestic. Domestic class pesticides products only available to householders for personal use in or around their homes.

All pesticides used in Canada must be registered under the *Pest Control Products Act* (a registration number will appear on each pesticide label). The only pesticide products that will not be assigned a Pest Control Products registration number are granular fertilizer/herbicide combinations which are registered under the *Fertilizer Act*.

Pesticides used in forestry fall in the following product categories defined by Health Canada:

3.1.2 Forest Management - Restricted

These products can be used for treatment of more than 500 hectares of a wooded area or of a site to be planted in a forest and may include aerial application. All products with designation for "forest" or "forest management" uses are classified as Restricted. The label of these products bear the statement: "This product is to be used only in the manner authorized; consult local pesticide regulatory authorities about use permits which may be required." In Alberta, persons applying pesticides for forest management on Crown lands must obtain a Pesticide Service Registration from Alberta Environment and an Authorization from Alberta Sustainable Resource Development.

3.1.3 Woodlands Management - Restricted

These products can be used for the treatment of no more than 500 hectares of a wooded area or of a site to be planted to forest. A site is defined as a continuous monoculture without a break in cultural practices or management stage. A continuous site of 1000 hectares, therefore, can not be divided into several blocks of 500 hectares and has to be treated individually. Products with directions for Woodland Management can be applied by air only if the label specifically indicated aerial application as a Restricted use. The restriction instructs the user to consult local pesticide regulatory authorities about use permits that may be required.

3.1.4 Woodlands Management - Commercial

Commercial pesticide products for woodland management can be used for treatment of no more than 500 ha of a wooded area, as follows:

- to woodlands only by ground equipment,
- in tree nurseries or seed orchards by ground or air
- in treed areas such as municipal parks by ground treatment only

Any information concerning pesticide registration is available from the Pest Management Regulatory Agency by calling 1-800-267-6315 or on the internet at ***http://www.hc-sc.gc.ca/pmra-arla***.

3.2 Provincial Legislation

3.2.1 Alberta Environmental Protection and Enhancement Act (AEPEA)

The Act was passed into law in 1993 and replaced eight separate Acts. Provisions for regulations of pesticides are set out in Part 8 of the *AEPEA*, with the enforcement provisions of the entire Act contained in parts 10 and 11.

Part 8 of the *AEPEA* set out the framework for the regulation of sales, use, application, handling, storage, transportation and disposal of all pesticides. Two associated regulations deal with pesticides: *Pesticide (Ministerial) Regulation (AR 43/97)* and *Pesticide Sales, Handling, Use and Application Regulation (AR 24/97)*.

Copies of *AEPEA*, the *Pesticide (Ministerial) Regulation (AR 43/97)* and the *Pesticide Sales, Handling, Use and Application Regulation (AR 24/97)* are available from Queen's Printer bookstore in Edmonton (780) 427-4952 or in Calgary (403) 297-6251, or can be downloaded from their website at http://www.qp.gov.ab.ca

3.2.2 Environmental Code of Practice for Pesticides

The *Environmental Code of Practice for Pesticides* is incorporated by the *Pesticide*

(Ministerial) Regulation and the *Pesticide Sales, Handling, Use and Application Regulation* under the authority of Section 36 of the *Environmental Protection and Enhancement Act*. Pesticide applicators and Pesticide services affected by this code must meet all the requirements to ensure that their activities are in compliance with Alberta's environmental laws. The Code of Practice provides specific details and requirements regarding the handling, use and application of pesticides. All pesticide applicators and Forest Management companies using herbicides are responsible for following the intent and content of the Code.

Copies of the *Environmental Code of Practice for Pesticides* are available from Queen's Printer bookstore in Edmonton (780) 427-4952 or in Calgary (403) 297-6251 or can be downloaded from their website at ***http://www.qp.gov.ab.ca.***

3.3 Pesticide Service Registration Requirements

Under the pesticide regulations, all Pesticide Services operating within Alberta must be registered in accordance with the *AEPEA*.

A Pesticide Service is a business, government agency or an organization that:

- Provides, or offers to provide, a pesticide application service for hire or reward
- Is applying pesticides on a right-of-way
- Is applying pesticides on a park, boulevard, campground, or picnic area located on public land. Public land meaning federal, provincial or municipal governments and irrigation districts
- Is applying pesticides for forest management.

Pesticide Service Registration is intended to:

- Ensure the public is obtaining the pesticide application services of only businesses that meet provincial regulatory requirements (including certified applicators)
- An up-to-date database of Pesticide Services is available to facilitate receiving important regulatory updates when necessary.
- Ensure that Pesticide Services are inspected on a regular basis and are in compliance with provincial pesticide regulations
- Facilitate rapid complaint response
- Facilitate enforcement action where necessary.

A pesticide service must employ at least one certified pesticide applicator. The types of services provided will be limited to those for which the applicator(s) is/are certified.

- Non-certified employees must be adequately supervised when handling or

applying pesticides.

- Pesticide application equipment must be in good working order.
- Records must be kept of each pesticide application.
- Pesticides must be stored in accordance with provincial regulations.
- Mixing and loading sites must be managed to prevent environmental contamination.
- Insurance coverage must be maintained (General liability insurance for all Pesticide Services of $1,000,000 plus $25,000 drift coverage for aerial and Agriculture classes).

A Pesticide Service can become registered by obtaining an application form from any regional office of Alberta Environment listed here or download them from Alberta Environment at ***http://www.gov.ab.ca/protenf/pesticide.***

Applicator Certification Requirements:

Any person involved in the application of a pesticide for hire or reward requires a pesticide applicator certificate. Hire or reward refers to compensation through exchange of money, commodities or services, but does not include exchange of agricultural production services (i.e. disking, swathing, combining, etc.) between two agricultural producers.

Classes of Applicator Certification

INDUSTRIAL: This class includes the use of herbicides by ground application for controlling weeds on industrial areas including roadsides, power lines, pipelines, rights-of-way, easements, railways, petroleum well sites and equipment yards.

In addition, this class includes herbicide applications to parking lots and landscaped areas surrounding industrial facilities for the control of designated noxious or restricted weeds.

FORESTRY: This class includes the use of pesticides by ground application in forest management operations and/or silviculture, forest seed orchards, outdoor nurseries and plantations.

AERIAL: This class includes the use of pesticides applied by aircraft.

*SPECIAL: This class includes the application of a pesticide for a specific use not covered by other classes, including but not limited to, the following:

- Seed,
- Interior plantscapes,
- Plant roots in sewer systems, and
- Vertebrate toxicants

**RESTRICTED: This class includes the application of pesticides restricted to a limited number of activities within one of the classes of certificates listed.

3.3.1 Pesticide Applicator Records Requirements

All applicators or assistants must keep records of their pesticide applications for a five-year period. These records must be available upon request of a pesticide inspector. The records must include the following information:

- The name of the person for whom the pesticide was applied;
- The location where the pesticide was applied
- The year, month, day and time at which the pesticide was applied;
- The name of the pest and purpose for which the pesticide was applied;
- The approved common name or trade name of the pesticides and the Pest Control Products Act (Canada) registration number;
- The application rate and total quantity of the pesticide applied;
- The method of application;
- If the pesticide was applied outside an enclosed structure, the meteorological conditions prevailing at the time of the application, including temperature, humidity, precipitation, and approximate wind speed and direction.

3.4 Requirements for Pesticide Storage

The *Pesticide Sales, Handling, Use and Application Regulation 24/97* states:

A person who stores a pesticide listed in Schedule 1 or 2 shall comply with the following requirements:

- The storage facility is secure from public access;
- A warning sign is affixed to the exterior door, entrance or gate to the storage facility;
- Floor drains leading directly or indirectly into a wastewater system, storm drainage system, waterworks system, or other potable water source, groundwater or an open body of water are protected from a release of a pesticide;
- Release of pesticide concentrate can be contained within the boundaries of the storage site;
- The floor base of the storage facility is protected from pesticide absorption;
- Open containers or packages of pesticide are closed or repackaged in a manner that controls the release of odours and vapours;
- Material safety data sheets and emergency telephone numbers are available for all pesticides stored and accessible at the storage facility.
- Persons responsible for the pesticide storage facility are knowledgeable of spill clean-up and fire response procedures;
- Pesticides are protected from rain, wind and other weather hazards.

All Service Registration Holders storing Pesticides will have their storage facility inspected by an inspector from the Alberta Environment.
If only enough of the pesticide is kept at the mixing and loading site to complete the spray operations for that area, then this would not be considered a storage site. In this situation, compliance to the regulations regarding Pesticide Storage is not required although if pesticides are left overnight, site containment and security should be considered. If the pesticides are left at one site and distributed to other mixing and loading sites as required, then the initial mixing and loading site where the pesticide is kept would be considered a storage site. Provisions for mobile storage are available at:
http://www3.gov.ab.ca/env/protenf/pesticide/usage/MobStorGuidelines.pdf.

3.4.1 Spill Cleanup and Emergency Response Information

Part 4 of the *AEPEA* empowers the government to prevent and control the release of substances into the environment. It ensures that the unlawful, unauthorized, or accidental release, as well as those exceeding prescribed amounts are quickly remedied to protect the environment. The Act imposes a requirement on companies to report substance releases so that control and cleanup are prompt and effective.

Those responsible for released substances have a duty to take remedial action. These measures include stopping the release, cleanup of the release, removal or disposal of the substance and restoring the environment to a satisfactory condition.

Emergency response equipment, including spill cleanup and safety equipment, is required at both the storage facility and the mixing and loading site.

3.4.2 Mandatory Emergency Response Equipment

Personal protective equipment including:

- Chemical resistant gloves;
- Coveralls and a chemical-resistant apron as required for the pesticides being handled;
- Chemical resistant boots;
- Eye protection
- Suitable cartridge respirators including extra cartridges for reusable respirators
- First aid kit;
- Emergency eyewash or emergency shower on site.

Emergency response information including:

- Material Safety Data Sheets (MSDS) or pesticide labels for the pesticides

being used;

- Emergency numbers as required for the pesticides being handled such as:
  - Alberta Environment's Complaint / Emergency number (1-800-222-6514)
  - The provincial Poison Centre (1-800-332-1414)
  - The local police department and fire department
  - The manufacturer or supplier of the pesticides.

Spill cleanup materials including:

- Appropriate absorbent materials, such as vermiculite, kitty litter, dry coarse clay, or commercial absorbent;
- Appropriate neutralizing materials, such as hydrated lime, bleach, or activated charcoal;
- A broom or shovel;
- Containers with lids for waste material or leaking containers and supplies to label the contents of the waste containers.

For all pesticide mixing and loading sites, the applicator must ensure that a contingency plan for the containment and cleanup of pesticide release is available and understood by personnel working at a pesticide mixing and loading site.

3.5 Special Use Approvals

A Special Use Approval is required when a company is proposing to use, store, or apply pesticides in a manner not consistent with the Environmental Code Of Practice which has various provisions to protect watercourses and water quality with application of herbicides. This approval is granted through Alberta Enviornment. ***http://www3.gov.ab.ca/env/protenf/pesticide/publications/factsheets/FS-PesticideUseInOrNearWater.pdf***

An SRD official can identify any open bodies of water to require a greater no deposit zone, where a 5 meter zone is viewed as inadequate protection to wildlife, fish and other aquatic life at that open body of water. This will be a condition in the authorization issued to forest companies.

4. HERBICIDES

4.1 Environmental Considerations with Herbicide Use

The acute toxicity of most herbicides approved for forestry use is generally low. The primary environmental concern is with the alteration of vegetation composition, structure and successional patterns that are known to be important for the provision of

habitat and the maintenance of biodiversity[1] in general. There may be a wide variety of effects on organisms as a result of any natural or manmade vegetation disturbances at a site, be it fire, harvesting, mechanical vegetation control, or herbicide use. An important consideration is to design man-made disturbances, such as herbicide application, in ways that will achieve the resource management objectives for the site and surrounding landscape. In many cases, wildlife and biodiversity objectives are tied to the variation in vegetation composition and structure that, in the past, has resulted from natural disturbance processes in a particular landscape and climatic region (e.g. Natural Regions and Subregions of Alberta). Emulating natural disturbance processes is considered to be a good precautionary approach to ensuring maintenance of the full range of wild plant and animal species that have evolved and adapted to regional landscapes. In this context, it is important to monitor and understand in what ways and time periods it takes herbicide-induced vegetation disturbance to recover through succession. Proper vegetation management planning (i.e. treatment type, herbicide type, timing, and product rates) will help to ensure wildlife habitat and biodiversity conservation objectives are met.

Some potential effects from herbicide applications:

- If buffers established during harvest operations are not maintained adjacent to watercourses, there may be a loss of vegetation canopy, which provides: a) cover for fish, b) protection from extreme water temperature fluctuations, c) protection from soil erosion, and c) insect and plant material for fish food.
- Properly timed herbicide application may result in short- to medium-term (1-4 years) reductions of herbaceous, shrubby, and deciduous tree vegetation.
- The aggregate of local, harvest block effects on wildlife habitat may result in significant and unintended landscape-level effects.
- Herbicide application is designed to ensure rapid post-harvest re-establishment of crop tree species, which provide essential vegetation cover and structure for many wildlife species. Early, post-harvest suppression of competing herbaceous vegetation (e.g. Calamogrostis spp.) may promote a more rapid re-establishment of deciduous shrub and trees species that provide important food and cover for many species of wildlife.

4.2 Herbicides Registered for Forestry Use

Product labels and descriptions of the herbicides registered for forest management use in Canada are provided by the Pest Management Regulatory Agency, available either at 1-800-267-6315 or online at ***http://www.eddenet.pmra-arla.gc.ca/4.0/4.0.asp***

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1 Biodiversity or biological diversity is the variety and variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species, between species and of ecosystems (United Nations Environment Programme 1992).

4.3 Methods of Herbicide Application

All herbicide applications must follow the requirements established by the pesticide products label, regulatory agencies (i.e. Department of Environment - Alberta Environmental Protection and Enhancement Act, Pesticide (Ministerial) Regulation AR 43/97 Pesticide Sales, Handling, Use and Application Regulation AR 24/97 and Environmental Code of Practice for Pesticides; Water Resources Regulation), and government and industry policies and procedures (e.g. these Guidelines).

4.3.1 Aerial Application – Helicopter Only

The following herbicides may be applied by aerial application methods:

- Glyphosate and triclopyr may be applied operationally;
- Herbicides registered for forestry use in Canada by aerial methods where the herbicide is being applied for evaluation purposes in accordance with an evaluation plan developed by the proponent and authorized in writing by a designated employee of Sustainable Resource Development, Public Lands and Forests Division;
- Experimental herbicides that are being tested for forest management registration in accordance with research permits issued under the Pest Control Products Act (Canada) and an evaluation plan developed by the proponent and authorized in writing by a designated employee of Sustainable Resource Development, Public Lands and Forests Division.

4.3.2 Ground Application – mechanical/manual

The following herbicides may be applied using ground application methods designated on pesticide labels as follows:

- Glyphosate and triclopyr may be applied operationally;
- Herbicides registered for forestry use in Canada where the herbicide is being applied for evaluation purposes in accordance with an evaluation plan developed by the proponent and authorized in writing by a designated employee of Sustainable Resource Development, Public Lands and Forests Division;
- Experimental herbicides that are being tested for forest management registration in accordance with research permits issued under the Pest Control Products Act (Canada) and an evaluation plan developed by the proponent and authorized in writing by a designated employee of SRD, Public Lands and Forests Division.

In terms of treatments, there are a variety of methods available to the applicator.

If a site preparation is required, the aim is to decrease vegetation competition so that

seedlings can be planted, survive, and grow in a good growing environment.

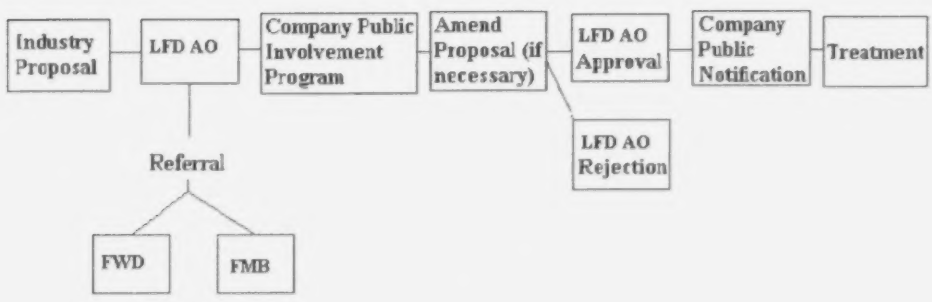
Herbicide should be applied when dominant problem plant species are most susceptible to the herbicide and when desirable species are relatively resistant or will sustain little damage.

5. PUBLIC LANDS AND FORESTS DIVISION REQUIREMENTS

5.1 Approval Process

The objective of this section is to provide an outline of herbicide proposal requirements and the approval process. The more thorough the proposal, the shorter the review/approval process.

FIGURE 2 Industry Operational Projects



FMB = Forest Management Branch; AO = Area Office;

For research related projects, the approval process is similar to the above but involves the submission of the proposal to the Forest Management Branch who co-ordinates the referral to both Fish and Wildlife and the Public Lands and Forests Division Area Office.

5.1.1 Treatment Objectives

Identify purpose of treatment (consider the objectives of the applicable management plan and regeneration standards, and other values and objectives):

- Conifer Release/site preparation;
- Operational/research;
- Control of specific competition;
- Review of alternative treatments.

5.1.2 Description of Treatment Area:

General Description of Treatment Area:

- Treatment area and location (legal description, disposition);
- Maps or aerial photos (no larger than 1:20,000).
- Potential mixing and loading sites.

Proposal Description:

- A table with the following information: ARIS opening number, total block area, area proposed for treatment, approved reforestation strata designation for treatment areas.
- Areas proposed for a second herbicide treatment must be identified and justified.
- Watercourses - permanent and intermittent watercourses and buffers must be mapped;
- Sensitive areas (e.g. traditional berry picking areas, wildlife, recreation areas, excessive slopes, soil erosion or slumping areas);
- General description of competing vegetation, crop trees and competitive interaction.

5.1.3 Wildlife, Fisheries and Biodiversity Objectives:

- Are wildlife, fisheries and biodiversity being addressed in the proposal?
- How are stand-level residual forest structures, live trees and retained understory vegetation being maintained to achieve objectives under the herbicide treatment proposal?
- Maps and aerial photos (no larger than 1:20,000) should be used to show areas within the treatment block where herbicide should not be applied, or should be applied in a special way, in consideration of wildlife, fisheries and biodiversity sensitivities (example: bear dens, mineral licks).

5.1.4 Industry Monitoring Requirements for Excursions

5.1.4.1 Post-Treatment Monitor Plan

The proponent will submit a post treatment monitor plan for possible excursions within the project area. The plan will detail the timing, the number of treatment areas to be monitored and the methodoligy used to conduct the

monitoring. The plan should also identify monitoring of those sites where the potential for a problem is perceived to be greater than normal (e.g. stream buffers, irregular boundaries, unfavourable atmospheric conditions) and other reported excursions.

The objective of the monitoring plan is to determine the existence of off-site applications (the excursion rate) on 100% of the project area. In year one of the proponents operational program, 100% of the treated blocks shall be monitored; in year two, 50%; year three, 25%; year four, 10%; year five onward, as stated in the post treatment monitor plan. If circumstances change, such as the equipment or contractor, more blocks should be monitored. The level of monitoring may also increase based on past history. For example, if proponent/applicator has a history of excursions, the proponent may have to monitor 100% of the blocks. It is recommended that the audit be performed jointly between the Company and the Public Lands and Forests.

5.1.5 Treatment Methodology, Rates, Timing, and Logistics:

A table containing a block by block description of Treatments, Methodology (air/ground), Rates, Timing (season or start date), and Special Features (i.e. sensitive areas) is required.

5.1.6 Public Involvement and Notification Requirements:

The proponent is required to give the general public the opportunity to review and provide input on proposed herbicide programs that are greater than 20 hectares.

5.1.6.1 Public Involvement

Public involvement programs (such as open houses, meetings, tours and office visits) must be scheduled to allow the public adequate time (a minimum of 30 calendar days) to forward any specific concerns and comments about the proposed project. The 30 day period would start on the date of the first advertisement, however, meetings, tours or open houses must be schedules to allow at least 15 calendar days for public comment.

The advertisement must be made a minimum of one week prior to the public involvement. The advertisement must identify that the program proposes to use herbicides; the area/location for the proposed treatment; the application method; and the timing of the application.

The company must contact the Public Lands and Forests Division Area office at least two weeks prior to the public involvement program regarding the date

and location of the public involvement program. Public Lands and Forests Division staff will monitor the program to ensure that all legitimate public concerns are addressed.

The company must submit a summary of the concerns identified by the public and how these concerns have been mitigated or addressed. If no legitimate concerns have been identified, or the concerns have been adequately addressed by the company, the Forest Area Manager will approve the project once a detailed review is conducted. Ideally the public involvement program would be completed after the proponent submits a draft proposal to Public Lands and Forests Division for review.

5.1.6.2 Public Notification

Once the program is approved in writing by Public Lands and Forests Division, a second advertisement in the local newspaper is required. The company must notify the public of the purpose and scope of the approved project in one or more local newspapers a maximum of 90 days and a minimum of 72 hours prior to the commencement of the herbicide project. The advertisement must include notification of approval, timing and location of the program, application method, and type of herbicide.

All private land holders, public land disposition holders, trappers and anyone that may be directly affected who are in or adjacent to the proposed treatment area must be contacted prior to the start of the project.

5.1.7 Overlapping Tenure

In cases of overlapping tenure, the herbicide proponent must also give the other tenure holder the opportunity to provide comments. Input of other tenure holders must be obtained prior to the public involvement process so appropriate input may be addressed in the development of treatment prescriptions.

5.1.8 Approval Process for Operational and Research Programs

The Public Lands and Forests Division must be allowed a minimum of 14 days to review the proposal following completion of the public involvement process and the submission of a complete proposal. Public Lands and Forests Division's will approve or reject the proposal (in writing) at the end of the 14 day period. It is preferred that a draft of the proposal is submitted to the Public Lands and Forests Division prior to public involvement to ensure Public Lands and Forests Division staff are aware of the proposal as concerns are brought forward.

Industry **operational** proposals are submitted to the Forest Area Manager.

Industry **research proposals** are submitted to Forest Management Branch.

5.1.9 Letter of Authorization

Public Lands and Forests Division (Area Office) must grant written approval of the proponent's operational project prior to treatment. All Letters of Authorization must be signed by the respective Forest Area Manager. The standard format for a standard Letter of Authorization is in Appendix II. Forest Areas may add conditions to the authorization letter but the removal of any standard conditions must be authorized by Forest Management Division.

5.2 Reporting Requirements

5.2.1 Program Summary Report

In addition to the standard reporting requirements for silviculture treatments, the proponent must submit a copy to both the local Forest Area and Forest Management Branch a copy of the Program Summary Report by November 30 of each year.

The Program Summary Report must be submitted in hard copy and digital form using the Microsoft Excel spreadsheet form described in Appendix V.

5.2.2 Reporting of Excursions

All excursions that are observed during or after the application must be reported immediately to Public Lands and Forests Division Area Office, Forest Management Branch and Alberta Environment. An excursion is any off-target application of herbicide.

The proponent will provide the following information regarding excursions:

- Location and size of damaged areas (including legal land locations and maps);
- The type and extent of vegetation damage by species with photo documentation;
- Type and extent of damage to non-vegetation resources (soil, water bodies, wildlife, etc.);
- An explanation of how the excursions might have occurred, and recommendations for mitigating;
- Any damage or other environmental concerns at excursion sites.

This information will be submitted on the Excursion Reporting Form provided by Public Lands and Forests Division (see Appendix III)

Regional Alberta Environment staff, Forest Management Branch and/or Public Lands and Forests Division Area Office, along with the proponent, may view reported excursions. The proponent will then send Public Lands and Forests Division Area Office 3 copies of a letter that details how they intend to minimize the chances of similar excursions occurring on future programs. The Public Lands and Forests Division Area Office will retain one copy and forward one to Forest Management Branch and one to Regional Alberta Environment staff.

5.2.3 Excursion Report

The Excursion Report must be done annually to follow the previous years' herbicide program. Excursion Reports must be submitted to the Public Lands and Forests Division no later than July 15th each year. One copy of the report is to be sent to the appropriate Public Lands and Forests Division Field Office and another copy directly to Forest Management Branch. The Excursion Report consists of the following mandatory components:

- Excursion Auditing Form (Appendix IV).
- Excursion Reporting Form (Appendix III) if applicable.
- Any other excursion related explanation letters or correspondence
- The summary or conclusion of the Post-Treatment Monitoring Plan

Report emphasis is given to the nature, size, location and cause of the excursion, as well as a strategy for risk management improvement geared towards preventing a similar occurrence. The proponent must use the Excursion Auditing Form to submit a complete listing of blocks that were monitored, with a total block count and sum of the area (hectares) checked. Excursions known at the time of occurrence must be reported to Public Lands and Forests Division Area Office, Forest Management Branch and Alberta Environment (Environmental Assurance Service) immediately. These excursions must also be followed up and included in the Excursion Audit and Excursion Report.

5.3 Evaluation Programs

Evaluation programs are required for herbicides that are currently not approved for operational use in Alberta. Evaluation programs must incorporate bona fide experimental design and address current data gaps. Public Lands and Forests Division (Forest Management Branch) must approve all evaluation projects prior to treatment.

5.4 Genetic Programs (Seed Orchard and Progeny Sites)

Public Lands and Forests Division approval is not required for herbicide treatments on genetic experimental and seed orchard sites on public land. Companies and Public Lands and Forests Division, however, must notify Forest Management Branch with respect to the hectares treated through their herbicide programs. The hectares treated on these sites will be included in the annual provincial total.

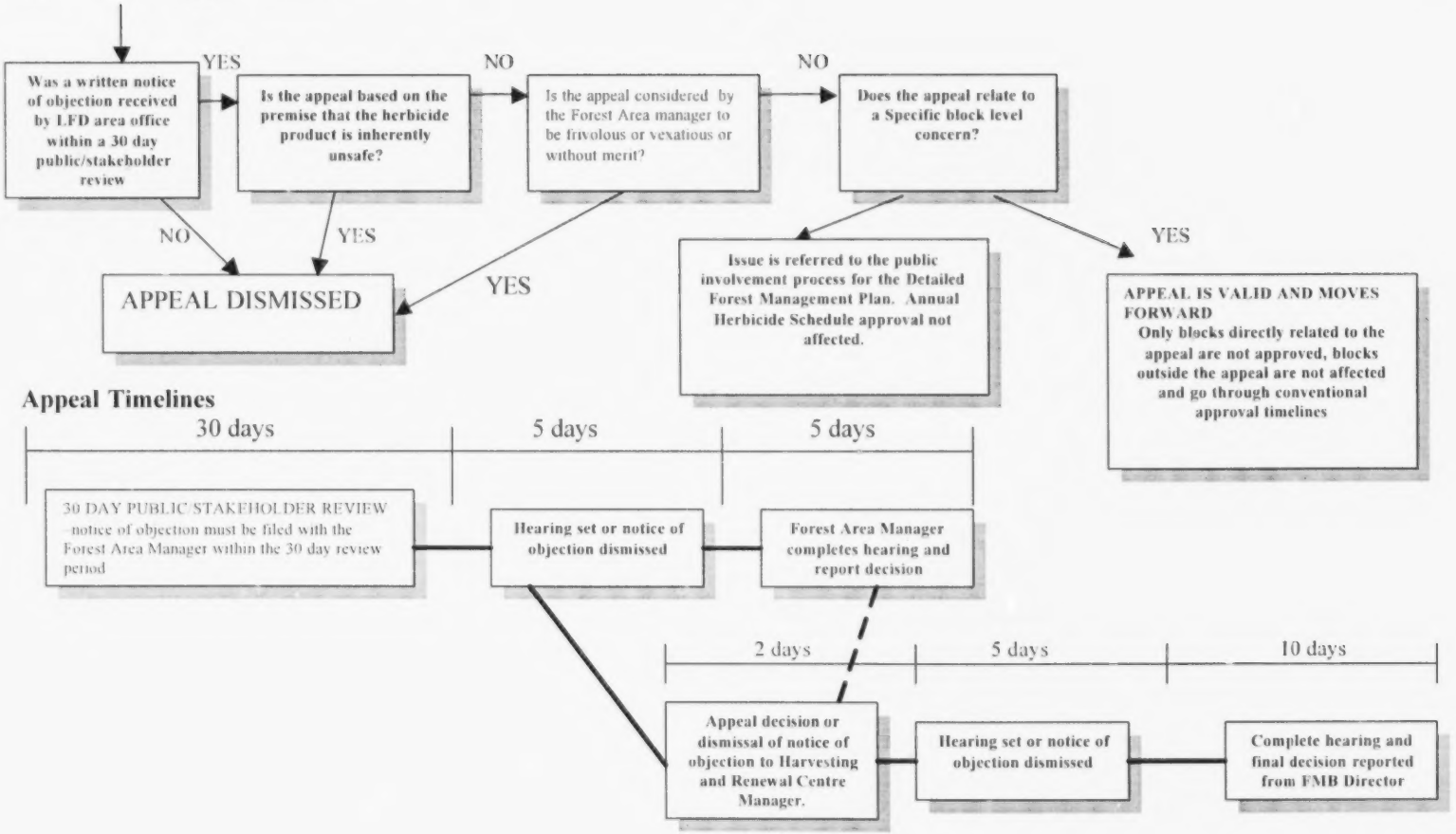
5.5 Operational Programs – 'Go Slow' Approach

In order to provide the opportunity for forest managers to develop expertise for the use of herbicides as a tool in forest vegetation management, annual limits are placed on each proponent's herbicide program. This 'go slow' approach will also provide the opportunity to build public confidence for the use of herbicides.

For the purposes of proposing and recording the number of hectares treated, one hectare treated equals one hectare, regardless of the type of treatment method (spot or broadcast).

In year 1 to year 3 of a proponent's operational program, the total area treated annually by each proponent will be limited. In the first year of an operational program, treatment area will not exceed 100 ha. In year 2 and year 3, treatment area will not exceed 300 ha and 700 ha respectively. In subsequent years, treatment area will be limited based on sections III and V of these guidelines. If the proponent is unable to complete year 1 or year 2 of the program (not both), because of factors beyond their control (e.g. weather), they may move up to the next increment.

FIGURE 3 Appeal Process


Was a written notice of objection received by LFD area office within a 30 day public/stakeholder review
YES
Is the appeal based on the premise that the herbicide product is inherently unsafe?
NO
Is the appeal considered by the Forest Area manager to be frivolous or vexatious or without merit?
NO
Does the appeal relate to a Specific block level concern?
NO
YES
APPEAL DISMISSED
YES
YES
Issue is referred to the public involvement process for the Detailed Forest Management Plan. Annual Herbicide Schedule approval not affected.
YES
APPEAL IS VALID AND MOVES FORWARD
Only blocks directly related to the appeal are not approved, blocks outside the appeal are not affected and go through conventional approval timelines
Appeal Timelines
30 days
5 days
5 days
30 DAY PUBLIC STAKEHOLDER REVIEW
-notice of objection must be filed with the Forest Area Manager within the 30 day review period
Hearing set or notice of objection dismissed
Forest Area Manager completes hearing and report decision
2 days
5 days
10 days
Appeal decision or dismissal of notice of objection to Harvesting and Renewal Centre Manager.
Hearing set or notice of objection dismissed
Complete hearing and final decision reported from FMB Director

5.6 Appeal Process

The herbicide appeal process is outlined in Figure 3.

5.6.1 Application

This procedure applies to all notices of objection filed in response to proposals submitted to obtain authorizations for forest herbicide applications only, and for appeals of rejections, authorizations and conditional authorizations that have been issued by the Sustainable Resource Development.

5.6.2 Combining Notices of Objection and Appeals

Where the Forest Area Manager receives more than one notice of objection in respect to a proposal or an appeal the notices of objection and the appeals may be combined for the purposes of dealing with them under this procedure. The Forest Area Manager shall notify the parties involved of his intent to combine similar notices of objection or appeals.

5.6.3 Notice of Objection

A notice of objection must be submitted to the Forest Area Manager under the following circumstances:

- Where a person believes they are directly affected by the proposed application and that a specific concern has not adequately been addressed by the proponent in their application for an authorization; or
- Where a proponent objects to approval conditions in the Letter of Authorization.

The submission must include:

- The name and title of the person (and as required, the designated spokesperson) who is making the notice of objection and the details of the specific concern that is objected to in the proponent's application for an authorization;
- A description of the relief requested by the person objecting; and
- The signature of the person objecting, a mailing address, and telephone number.

The Forest Area Manager may dismiss a notice of objection if:

- The notice of objection is based on the premise that the herbicide(s) being used are inherently unsafe;
- He/she considers the notice of objection to be frivolous or vexatious or without merit;
- The person submitting the notice of objection is not directly affected by the proposed herbicide application;
- The notice of objection was not filed within 30 calendar days of the commencement of the proponent's public involvement program; or
- The proponent has not filed objection to a condition(s) of an authorization or to rejection of a proposal by the Forest Area within 5 working days of the authorization or rejection.

The Forest Area Manager will provide a written response to the person filing the notice of objection as to why the notice of objection was dismissed. Copies shall be provided to the Provincial Herbicide Coordinator.

5.6.4 Notices

Where the Forest Area Manager makes a determination to proceed with a notice of objection, he shall:

- Fix a date for the hearing and provide the written notice of the date within 5 calendar days of receiving the notice of objection;
- When possible, complete the hearing within 5 calendar days following the final day of the notice period; and
- Ensure that the required information from all parties (proponent, stakeholder, government representatives) is included in the hearing.

5.6.5 Electronic Hearing

The Forest Area Manager, may with the consent of the parties, conduct a hearing by teleconference where not all of the participants are in the same room, as long as it is physically possible for each of the participants to hear and respond to comments of the other participants at the time the comments are made.

5.6.6 Decisions, Reports, Recommendations

A written report and a decision of the Forest Area Manager must contain the following:

- A summary of the evidence;
- A statement of the issues to be decided;
- The recommendations or the decision;
- The reasons for the recommendations or the decision.

A copy of the report and a decision shall be sent to all parties of the appeal within 5 working days of the hearing.

5.6.7 Appeal of an Authorization or Rejection of a Proposal

An appeal to the Forest Management Branch Director must be made within 5 calendar days of the decision by the Forest Area Manager. Only the following parties may appeal a decision by the Forest Area Manager to the FMB Director:

- The proponent that has filed a written notice of objection with the Director during the time frame specified;
- Any party that filed a written notice of objection with the Director during the proponent's public involvement program.

When possible, the Forest Management Branch Director shall reach a written decision on the matter of the appeal within 5 calendar days and shall send a copy of the decision to all affected parties. The Forest Management Branch Director's decision shall be final and binding on all parties.

6. GUIDELINES FOR THE USE OF HERBICIDES FOR SILVICULTURE IN ALBERTA

A number of tools are necessary to support various silvicultural systems. Herbicides are one silvicultural tool that may be used to manage forest vegetation to achieve specific forest management goals. Generally, they are used to reduce competition during site preparation and stand-tending operations. The silvicultural objective is typically to establish, maintain and/or improve the growth of desired tree species. Forest vegetation management practices, including the use of herbicides, require careful consideration of all forest management objectives (e.g. fiber, wildlife, recreation, watershed, grazing) and all vegetation management options available to meet these objectives in an environmentally sound manner.

Alberta Sustainable Resource Development (SRD) supports the responsible use of herbicides for forest vegetation management on public lands in accordance with provincial and federal legislation and the following provincial guidelines. In accordance with the National Forest Strategy, SRD supports the use of alternative vegetative management control methods including non-chemical approaches and biological controls where appropriate. The National Forestry Database provides detailed statistics regarding forest management herbicide use and is available at ***http://nfdp.ccfm.org***.

Site Preparation

Herbicides may be used to prepare a site for artificial or natural regeneration of desired tree species under the following conditions:

- When control of grass is required to reduce competition that, if left untreated, is capable of causing seedling mortality or significant growth loss, particularly in the first years of seedling development.
- To inhibit sprouting or suckering of non-crop, woody vegetation that is widespread, or has the potential to become widespread, and is in or may be in sufficient abundance to dominate the site and limit the success of reforestation or afforestation efforts;
- For desiccation of non-crop woody vegetation to facilitate prescribed burning;
- Before a stand is harvested through stem injection, or spot, band, or broadcast application to reduce the sprouting or suckering of competitive, non-crop, woody plants;
- When mechanical site preparation equipment or the application of prescribed fire will contribute to site degradation, excessive site disturbance or destruction of advanced growth.

Stand Tending

Stand tending (e.g. cleaning, weeding, and spacing) improves the survival, growth, composition and/or structure of a young forest stand by reducing competition from non-crop vegetation.

Tending treatments may be applied to stands to achieve or maintain reforestation standards (including Establishment and Performance Free-to-Grow Standards). Minimum stocking, height, species and free-to-grow standards are legislative requirements of Alberta's Forests Act and are detailed in the Timber Management Regulation and Alberta Regeneration Survey Manual.

Free-to-grow stands include those stands that meet specific stocking and height standards. Crop trees in these free-to-grow stands must be relatively unimpeded in their ability to grow above competing vegetation.

Herbicides may be used when projected stands will not meet free-to-grow standards because of competition. Herbicide treatments should be confined to the minimum area required to practically and economically accomplish the vegetation control objectives.

Integrated Vegetation Management

Herbicide is one tool that may be used to help regenerating blocks achieve free-to-grow status. Successful use of herbicide relies on a sound knowledge of herbicide efficacy and must take into account site-specific conditions. To accomplish this the following must be considered:

- Alternative silvicultural systems and site preparation treatments that will minimize the establishment of competitive non-crop species. Treatments should be prescribed only after considering the ecological characteristics of crop and non-crop plants that are on or near the site.
- Artificially regenerate or encourage natural regeneration of desired tree species as soon after harvest/site preparation as possible. Delays at this stage often increase the need for later tending treatments.
- Use of vigorous planting stock of appropriate species where fast growing shrubs, hardwoods and/or herbaceous plants or grasses are likely to be a problem.
- Utilization of viable mechanical, biological and manual methods.
- Selective application of the herbicide where the block is stratified.
- Label recommendations and reduced application rates if they can achieve the desired results.
- Herbicide, rate, timing and method of application that are best able to control the target competing species.
- Ground applications, including single tree or spot herbicide treatments, should be utilized where practical and effective.
- In general, only one herbicide treatment should be required in a rotation. However, authority to treat areas more than once can be approved with sufficient justification.

Wildlife Protection and Maintenance of Biodiversity

The forest community is dynamic. Different vegetation communities in a forest exist at different stages in the forest's development. Disturbance is a common occurrence in a forest and typically leads to a shift in vegetation composition and species abundance as a function of the type and intensity of disturbance. Herbicides can be an effective tool to selectively and temporarily reduce the abundance and growth rate of vegetation that competes with the establishment of crop trees. Potential changes to vegetation succession that are likely to be of most concern to wildlife managers are situations where there is a significant alteration in the composition, structure and duration of low and tall shrub communities. Shrub communities are very important in providing food and cover for many species, including moose, snowshoe hare and various songbirds. Herbicide treatments should be timed so as to minimize unintended and incidental impacts to vegetation types and structures of importance to wildlife, particularly regenerating deciduous shrubs and trees.

Potentially, herbicides may affect wildlife in two ways:

- By acute or cumulative toxicity, or
- By altering habitat.

Acute or cumulative toxicity is not believed to be a concern as only herbicides that are registered for forest management use by the federal government may be used in. Herbicides used in forest management in Alberta are approved by Health Canada's Pesticide Management Regulatory Agency on the basis that there are no significant acute or cumulative toxicity effects on fish and wildlife when used according to label instructions and the guidelines contained in this manual.

The following material will discuss how to minimize adverse effects to wildlife, and biodiversity in general, brought about by herbicide-induced changes to vegetation composition, abundance and successional processes.

Literature reviews and compendiums, on the use of glyphosate for forest management, offer some direction (see Appendix 1 Selected References). Also recent studies in Alberta and from other jurisdictions are helpful. Based on this information, and existing knowledge on the effects of other types of habitat changes on wildlife, a set of guidelines has been prepared. Using an adaptive management framework continued monitoring and research studies are integral to improving the library of knowledge available to assist forest managers and to make updates to these guidelines. Recommendations below were written for aerial and ground applications of herbicide, particularly glyphosate. The forest manager should apply these guidelines in a landscape context and demonstrate how wildlife habitat issues have been factored into the vegetation management plan. The following considerations should be kept in mind when reviewing and using these guidelines:

- The greatest change in community or habitat structure that occurs on a commercially utilized forest site (barring natural disturbances such as fire and blowdown) is the

harvest of mature trees.

- The decrease in vegetation abundance following herbicide application is of relatively short term in duration (1-4 years).
- Early control of competing vegetation in a cutblock (within two years following harvest) may greatly enhance the crop tree's ability to overcome early succession competition. Such early treatment may allow for earlier and more successful deciduous shrub and tree succession, than if herbicide treatment occurred 3-5 years after harvest (if this is consistent with the reforestation objectives), although this needs further research and documentation.
- The guidelines provided here need to be considered and implemented within the context of the detailed forest management plan for an area and relevant wildlife, fisheries and biodiversity management objectives. It will be difficult, if not impossible to meaningfully apply these guidelines without that context, as they are not meant to be applied in all harvest locations at all times.

6.1 Riparian Management Zones and Watercourse Protection Buffers

Objective:

To ensure that any use of herbicides to manage vegetation in riparian zones reflects the fact that priority resource values and objectives in these areas are usually related to non-fiber values such as water, fish, wildlife and recreation.

Background:

Riparian vegetation adjacent to streams, seeps, intermittent and ephemeral watercourses, ponds, and other water bodies, is particularly important to many wildlife species. These zones generally support a high diversity of species and may also serve as movement corridors for wildlife. Riparian vegetation provides shade to streams and rivers, which in turn provides cooler water temperatures favored by many fish species (e.g., trout species) in Alberta. Also, deadfall and normal leaf drop, into streams and rivers during autumn, provides an important nutrient source for scavenging aquatic invertebrates.

The importance of keeping the herbicide out of open bodies of water has already been addressed in the Alberta Environmental Protection and Enhancement Act, Pesticide Regulations (see Sec. C(2)). Where tree harvesting does occur within defined riparian zones that have high priority wildlife and biodiversity conservation, vegetation management objectives may not require, or want, the rapid re-establishment of crop trees. Traditional forest regeneration and site preparation practices, including the use of herbicides, may not be appropriate in these circumstances.

Guideline:

Ensure that the application of herbicides within, or adjacent to, riparian zones that are managed primarily for wildlife and biodiversity values, reflects the vegetation management priorities and objectives of those zones. Use should be made of risk management plans that address the priority habitat resource values and management objectives of riparian areas.

6.2 Snags and Live Trees Protected for Wildlife

Objective:

Residual live trees and snags (standing dead trees) retained as wildlife habitat during the harvesting process should not be lost through follow-up silvicultural activities.

Background:

Forest managers realize the value of snags and other live residual trees left on the blocks to maintain specific wildlife habitat and biodiversity values. The retention and management of residual structures within harvest blocks should be coordinated with the silvicultural plan (including herbicide application) to ensure wildlife and biodiversity objectives are met.

Guideline:

Herbicide application should avoid residual live trees (when consistent with site objectives), and associated understory vegetation, that has been retained within the harvest block, if specific wildlife habitat and biodiversity objectives relating to structure are to be met. For harvest blocks that are likely to be treated by herbicides and have objectives for retention of residual structures for wildlife, it will generally be more practical to leave a few large residual patches, than many small patches or individual trees.

Standing residuals should remain untreated if they are 'clumped' (and no conifer trees were harvested from these clumps). In some cases, scattered individual residuals may be treated with the remainder of the cutblock. This will result in the creation of both dead snag habitat in the short-term and living residuals for long term snag recruitment.

6.3 Untreated "Leave Strips"

Objective:

To protect residual shrubs and deciduous trees in portions of the harvest block for use by wildlife and to encourage structural variability for biodiversity maintenance within regenerated stands.

Background

Many wildlife species benefit from residual and early successional woody vegetation within regenerating cutblocks. Species such as deer and elk take advantage of forest disturbance edges. They use unharvested mature forest as shelter and nearby shrubs and regenerating trees in harvest blocks as food. The vegetation immediately adjacent to the uncut forest is generally used more heavily by edge species, such as deer and elk. Other species of birds, small mammals, insects, beetles, and snails use the abundant forage and low cover throughout the harvest block. Berry-producing shrubs (e.g. blueberries) are particularly important to many wildlife species and also may be of value to people in the region.

Guideline

Portions of some harvest blocks should be considered for modified or no treatment by herbicides. Particular consideration should be given to intermittent and ephemeral watercourses and draws, as well as the periphery of harvest blocks where there are irregular block boundaries. Cutblock edge areas will be relatively more attractive and useable by ungulates and other forest species because of the adjacent cover provided by forested leave blocks. Watercourse areas and watercourse margins are particularly rich in biodiversity and serve as important wildlife movement corridors, even where commercial trees have been removed but the understory vegetation has been protected from disturbance. If competing vegetation, such as *Calamagrostis canadensis*, is a significant problem, timely and judicious application of herbicide could help to achieve wildlife habitat objectives, such as shrub regeneration.

6.4 Timing of Treatments

Objective

The broadcast application of herbicides should be timed to minimize impacts to spring and early-summer nesting birds that use early herbaceous and shrub communities within harvest blocks.

Background

Open habitat, ground- and shrub-nesting bird species will quickly invade forest areas that have been recently harvested, once there is sufficient vegetation cover. The primary nesting season for these bird species is throughout the month of June and into the first week or two of July. By avoiding herbicide application during this time period, impacts to the reproduction of local birds will be minimized. Once the young are hatched and fledge from the nest site, they can move with the adults to other locations for foraging, in the event of disturbances such as herbicide application.

Guideline

Apply herbicide treatments within the first year or two after harvest, and on a seasonal basis after mid-July, to minimize impacts to open habitat, ground- and shrub- nesting birds.

6.5 Landscape Planning

Objective

To ensure that adequate amounts and patterns of all representative and unique vegetation/habitat types are maintained throughout the larger forest landscape over time.

Background

Harvest and post-harvest silvicultural treatments, in aggregate, have the potential to shift the composition and structure of regenerated stands towards plantation forests that have significantly reduced natural stand characteristics. The potential for long-term and broad-scale conversion of unmanaged or less-actively managed stands, that are relatively diverse in structure and composition, to more intensively managed and homogeneous stands could have a pervasive influence on the long-term biodiversity of harvest landscapes (Nilsson 1997). Management practices that create post-harvest forests and forested landscapes that maintain levels of variability similar to those resulting from natural disturbance processes are desirable from a wildlife and biodiversity conservation standpoint.

Guideline

Use herbicide treatments in combination with other silvicultural practices to create and maintain variable patterns and distributions of managed forest stands, such that landscape-level wildlife habitat and biodiversity conservation objectives can be achieved. The amounts and patterns of regenerated stands should be based on regional and forest-level assessment and planning processes that involves the forest industry, regulatory agencies, and the general public. Ensure that wildlife and biodiversity related goals and objectives, comparable to timber-harvesting ones, are developed in these planning processes. A rigorous adaptive management approach should be implemented so that successes and failures in achieving management objectives are identified quickly and management actions are changed accordingly.

7. RISK MANAGEMENT PROVISIONS FOR AERIAL HERBICIDE APPLICATIONS

Risk is defined as "chance or possibility of danger, loss, injury or other adverse consequences". With respect to herbicide use, risk can generally be categorized into two different types:

- Herbicide Release: an unauthorized release due to spills, leaking equipment (nozzles/booms) or applications to an area not approved.
- Excursions: movement of the herbicide off of the approved application site.

Through experience and continual developments in equipment technology, risk management techniques can be incorporated into spray programs to minimize risk. In the herbicide proposals the Company must identify risks associated with the proposed operations and how they intend to manage these risks. Listed below are some potential subject areas to be considered:

- Equipment including nozzle and boom configurations
- Pre-Spray Meetings
- Reconnaissance Flights
- Perimeters
- Buffers (adjacent to sensitive areas - i.e. watercourses, forest edge)
    - Spray buffers set based on risk and by using topographic features to enhance the effectiveness of the spray buffer
    - Flagging of spray buffers (especially along watercourses) to ensure they are clearly visible to the pilot;
    - Timing of aerial spraying adjacent to spray buffers
- Block Monitors
- Environmental factors including wind, temperature and relative humidity

8. SRD SPOT AUDITS

8.1 SRD Audits During Operations

Sustainable Resource Development Officials have the authority to check for the following when conducting an inspection during a pesticide application:

i. Applicators should be carrying the appropriate class of an applicator certificate with them during pesticide applications. An inspector can verify whether an applicator has an applicator certificate by calling a regional office of Alberta Environment or the Lakeland College Pesticide Applicator Certificate Program at 1-866-853-8646. Check to see if the certification class

is appropriate for the type of pesticide application being conducted.

ii. Check to see if non certified applicators are properly supervised. The Requirements for supervision have been covered earlier in the provincial legislation section.

iii. The company in which the applicator is performing the pesticide application should have a Service Registration. Verification of Service Registration can be obtained by phoning any one of the Pesticide Section regional offices.

iv. Check for proper storage at the mixing and loading site. Check to see if the facility is designed to contain a spill from moving off the site and that all safety and spill cleanup equipment is available. This is also important for the mixing and loading site.

v. Check to see if all required information is recorded in the applicator/service registration records.

The inspection sheet in Appendix VII can be used as a guide for completing an inspection during pesticide applications. If there are any concerns about the application site, the completed form can be faxed to the Forest Management Branch – Provincial Herbicide Coordinator at (780) 427-0085 for follow-up.

8.2 SRD Post Treatment Audits for Forest Management Projects (<12 months)

Post treatment inspections may be carried out following the date of application. A sufficient amount of time must have passed for the herbicide effect to be noticeable (approximately 12 months with glyphosate). To assist the Forest Officer in reporting any pesticide excursions, a Post Treatment Inspection Form is found in Appendix VIII.

The main objective of the post treatment inspection is to identify any incidents of herbicide deposition off the approved treatment site and to ensure that there is no deposition of herbicide within 5 meters of an open body of water (when herbicides listed in the Environmental Code of practice are used for forest management).

The degrees of herbicide excursions will vary. If the incident is severe, the area may be re-inspected and the nearest regional Alberta Environment staff may request the Public Lands and Forests Officer to attend a joint follow-up inspection, vegetation samples would be taken of affected vegetation for chemical analysis and a determination may be made in respect to what compliance action would be appropriate.

Appendix IX outlines common causes of herbicide damage as well as natural stress and injury symptoms.

9. ENFORCEMENT PROVISIONS

9.1 Investigations

Alberta Environment conducts investigations into potential contraventions of provincial pesticide regulations. The most common of which are:

- An adverse effect to the environment;
- Damage resulting from migration of the pesticide from the target area;
- The improper use of a pesticide (i.e. off label uses);
- Possible contravention of approval conditions;
- Various incidents that relate to pesticide applicator certification.

Types of Investigations

Alberta Environment has broken down the types of investigations into the following categories:

- Aerial Drift - complaints involving aerial applicators
- Container Sites - incidences involving offsite movement
- Disposal Practices - illegal dumping of chemicals causing damage to the environment
- Environmental Damage - damage to public land (i.e. water and land)
- Fire- involves the health/safety and cleanup of storage facilities that have burned down
- Ground Drift - involves drift onto neighbouring properties from a ground application
- Health & Safety - health concerns expressed by the public from an application
- Misapplications - application to the wrong property.
- Offsite Movement - movement of chemical offsite either by runoff or slope - residual herbicides
- Unregistered Use - product use deviates from product label instructions
- Spill - involves health/safety and cleanup of a spill site
- Uncertified Applicators/Non-Registered Services
- Vendor- any investigation involving a pesticide sales outlet
- "No Deposit Zone" Violation – non compliance to the Code of Practice for Pesticides (no glyphosate within 5 meters of an open body of water)
- Miscellaneous Nature - includes investigations that are not related to pesticide damage.

Evidence

During an investigation, information is gathered to determine if a contravention has occurred and to assist in determining the appropriate enforcement response. The specific information gathered is the:

- Degree of adverse or potential adverse effect on the environment or human health;
- Compliance history of the party under investigation;
- Intent of the party;
- Extent of non-compliance;
- Steps taken by the party to rectify the situation;
- Steps taken to avoid the incident and prevent its recurrence;
- Degree of care associated with the operation.

Additional information that may be collected:

- Witness Statements;
- Applicator Statement (may include Warned Statements);
- Applicator or Sales Records;
- Weather Reports;
- Photographs;
- Samples (vegetation, soil, water).

9.2 Penalties

The following are a list of enforcement options that may be considered in the case of contraventions to the *Alberta Environmental Protection and Enhancement Act*:

Ticketable offences: issued for specified offences by special constables where a previous warning of the contravention has been given and the company has failed to correct the situation. Fines range for these offences from $100-300.

Administrative Penalties: issued by the Director for contravention s to most sections of the pesticide regulations, including administrative deficiencies. An example of a contravention in which an administrative penalty could be issued is where a summary is not submitted for a Special Use Approval. Administrative Penalties came into effect in 1995 with fine maximums up to $5000.

The Director may increase or decrease the amount of the base penalty after considering the following factors:

- Importance of compliance to regulatory scheme;
- The degree of wilfulness or negligence in the contravention;

- Whether or not there was any mitigation of the consequences of the contravention;
- Whether or not the person who receives the Administrative Penalty has a history of non-compliance;
- Whether or not the person who receives the Administrative Penalty has derived any economic benefit from the contravention;
- Any other factors that, in the opinion of the Director, are relevant.

9.3 Environmental Protection Order

When in the opinion of the Director that the manufacturer use, handling, transportation, storage sale, disposal or application of a pesticide has caused an adverse effect the Director may issue and Environmental Protection Order to the person responsible for the pesticide.

An Environmental Protection Order may order the person to whom it is directed to do any or all of the following:

- To stop, limit or control the manufacture, application or release of the pesticide into the environment permanently, or for a specified period of time in the circumstances set out in the Environmental Protection Order;
- To comply with any directions of the Director relating to the pesticide or any thing in which the pesticide is or was contained may be used, handled, transported, stored, sold, manufactured or disposed of;
- To comply with any directions of the Director with regards to the clean up of the pesticide or the clean up or restoration of a site affected by the pesticide.

Emergency Environmental Protection Order

Where an inspector, an investigator, or the Director is of the opinion that significant adverse effect may occur, is occurring has occurred as a result of the manufacture, use handling, transportation, storage, sale disposal, or application of a pesticide, the inspector, investigator or Director may issue an Emergency Environmental Protection Order to the person responsible for the pesticide directing the performance of emergency measures that the inspector, investigator or Director considered necessary.

9.4 Offences and Penalties of the Alberta Environmental Protection and Enhancement Act

Where an offence is committed under the Act, under the Regulations, in a case of an individual, to a fine of not more that $50,000 or imprisonment for a periods of not more than 2 years, or to both a fine and imprisonment, or in case of a corporation, to a fine of not more than $1,000,000.

Due Diligence Defence

No person shall be convicted of an offence if that person took all reasonable steps to prevent its commission.

9.5 Other Consequences

Certified applicators and registered pesticide services may be sanctioned under the Code, the *Pesticide (Ministerial) Regulation (AR 43/97)* or the *Pesticide Sales, Handling, Use and Application Regulation (AR 24/97)*.

Silviculturalists may also be sanctioned for violations of water bodies or riparian habitats with pesticides by being required to demonstrate the ability to safely use forest management herbicides on a small scale before being allowed to treat large areas again. This may take the form of either reduction in area approved for treatment or by the Public Lands and Forests Division setting a maximum allowable treatment for up to three years. This is to ensure that operational expertise is clearly demonstrated before the silviculturalist is allowed to propose area for treatment based on need.

The Public Lands and Forests Division also reserves the right to place restrictions on a program through the Letter of Authorization. For example: a Forest Officer may be required to attend all Excursion Audit field visits (with the proponent), an increased number of blocks to be included in the Excursion Audit, or restrictions on the number of spray helicopters or ground crew.

Similar sanction action may also be directed for excursions occurring outside of block boundaries or within other no-treatment zones, depending upon the severity, number and effects of the excursions.

In the event that it is deemed by the Public Lands and Forests Division that a forest company has unacceptable amounts of excursions, or that excursions have occurred due to a lack of due diligence on the part of the forest company, the Public Lands and Forests Division can levy the following measures against the company. These punitive measures are designed to reduce the risks associated with herbicide application, to promote better risk management procedures and to limit potential environmental impacts.

1. Have the forest company submit a detailed risk management to the Public Lands and Forests Division that would outline how the company will manage risks to avoid future excursions.

2. Limit the number of hectares a forest company can treat for a defined period of time, or until it is proven the company has made the required steps for the company to conduct future herbicide applications in a safe and effective manner that will also limit future excursions.

3. Return the Forest Company to the "go-slow" approach as defined by this manual. This process would limit the amount of hectares a company can spray for a three-year period. This will provide the company a period of time to prove their ability to use herbicide a safe silvicultural tool.

4. Suspend the Forest Company from herbicide use for one year prior to embarking on the go-slow approach.

These measures would be administered at the discretion of the Area Manager and would be subject to the appeal process as described in this manual.

Appendix I Selected References

1. Kidd, F. A. and Mihajlovich, M. (compilers) 1998. Triclopyr herbicide: a bibliography of technical references of non-target field and laboratory reports. MarCon International, Inc., Carmel, Indiana and Incremental Forest Technologies, Ltd., Edmonton, Alberta. 144 pages.

2. Lautenschlager, R.A. and Sullivan, T.P. 2002. Effects of herbicide treatments on biotic components in regenerating northern forests. Vol 78, No. 5, The Forestry Chronicle.

3. Lautenschlager, R.A. et al. 1997. A series of 10 articles on the Fallingsnow project (a comparison of herbicide release of conifers with other types of release) in northwestern Ontario. Forestry Chronicle 73:35-112.

4. Lautenschlager, R. A. 1993. Response of wildlife to forest herbicide applications in northern coniferous ecosystems. *Can. J. For. Res.* 23: 2286-99.

5. MacKinnon, D.S., and B. Freedman. 1993. Effects of silvicultural use of the herbicide glyphosate on breeding birds of regenerating clearcuts in Nova Scotia. Can. J. Applied Ecology 30:395-406.

6. Nilsson, S.G. 1997. Forests in the temperate-boreal transition: natural and man-made features. *Ecological Bulletin* 46:61-71.

7. Sullivan, D.S., and Sullivan, T.P. (compilers) 1997. Non-target impacts of the herbicide glyphosate: a compendium of references and abstracts. 4th edition. Applied Mammal Research Institute, Summerland, B.C., 302 pp.

8. Sullivan, T.P., R.A. Lautenschlager, and R.G. Wagner. 1996. Influence of glyphosate on vegetation dynamics in different successional stages of sub-boreal spruce forest. *Weed Technology* 10: 439-446.

Appendix II Herbicide Project Authorization Letter

DATE

Dear Proponent:

RE: HERBICIDE PROJECT AUTHORIZATION

Department of Sustainable Resource Development staff have reviewed your herbicide project proposal dated _____ and have authorized this project in accordance with the latest edition of Guidelines for the Use of Herbicides for Silviculture in Alberta, published by Sustainable Resource Development, subject to the following conditions:

1. All herbicide treatments must be conducted by a Registered Pesticide Service in accordance with all applicable federal, provincial and munic ipal legislation. Any questions regarding the regulatory requirements of Registered Pesticide Services can be directed to the Alberta Environment regional inspector.

2. The *proponent's name* must ensure that the public has been advised of the purpose and scope of the project by means of a notice published in one or more newspapers within the vicinity of the proposed treatment sites a maximum of ninety days and a minimum of 72 hours prior to the commencement of herbicide treatments.

3. Prior to commencement and upon completion of the project Public Lands and Forests Division, _____ Area Office (phone number) must be notified.

4. *Proponent's name* must identify an authorized representative that will be cognisant of the herbicide project and available on site while herbicide treatments are being conducted.

5. All herbicide treatment locations, areas, pesticides used, application methods, application rates, and application time frames are restricted to those identified in the project proposal submitted by (*proponent & contact name*) and reviewed by the Department of Sustainable Resource Development in consideration of this Herbicide Project Authorization.

6. The Certified Pesticide Applicator responsible for supervising pesticide mixing must be in possession of a copy of this Herbicide Project Authorization and a copy of the corresponding project proposal while herbicide treatments are being conducted in accordance with the latest edition of the Environmental Code of Practice for Pesticides published by Alberta Environment.

7. The locations of mixing/loading sites that are not within proponent's name disposition must be authorized by Public Lands and Forests Division, ___ Area Office prior to use.

8. *Proponent's name* must monitor areas for excursions in accordance with the monitoring plan included in the project proposal submitted by *proponent & contact name* and reviewed by the Department of Sustainable Resource Development in consideration of this Herbicide Project Authorization. Any excursions identified must be reported to Public Lands and Forests Division, ___ Area Office on or before ___ in accordance with the requirements stated in the Guidelines for the use of Herbicides for Silviculture in Alberta.

9. All water course crossings required for ground access herbicide treatments must comply with Section 3.4.3 of the Alberta Timber Harvest and Operating Ground Rules, and the Code of Practice for Watercourse Crossings if applicable.

10. A summary of the Herbicide Program stating the quantity of herbicide used, dates of treatment and amount of area treated and information regarding special operating conditions must be forwarded to Public Lands and Forests Division, ____ Area Office and Forest Management Branch by November 30, ____.

11. All herbicide applications shall be completed prior to December 31, ___ unless otherwise specified.

Should you require any further clarification regarding this authorization letter, please contact ____ at _____.

Signed:

Forest Area Manager
Forest Area

cc: Wildlife Biologist
Provincial Herbicide Coordinator - Forest Management Branch

Appendix III Herbicide Excursion Reporting Form

Company Name:	
Company Address:	
Contact Name:	
Contact Telephone No.:	
Name of Pesticide Application Service:	

REPORTED INCIDENT INFORMATION:

Incident Date: (dd/mm/yy)		**Incident Time:**	
Location of Incident:			
Licence / FMA No.:			
Cutblock No.:			
Number of Excursions:		**Area (ha):**	

Legal Land Description:	**M**	**RGE**	**TWP**	**SEC**	**1/4**

Comments:	

INCIDENT TYPE:	**INCIDENT SUB-TYPE:** ***(check one)***		
IMP - IMPACT	VEG - Vegetation		
	CNW - Contaminated Water		
	CNS Contaminated Soils		
LEG - LEGISLATION	OPR - Operating without approval / authorization	REG - Regulation (No Impact)	NRU - Non-Registered Use
	APP - Approval Condition (Applying pesticides contrary to SUA)	TRN - No Training Certificate	
REL - RELEASE	SPL - Spill	DSC – Discharge	Unauthorized treatment, area or application

Pesticide:	
Type and Extent of Damage	
Vegetation:	
Non Vegetation:	
Suspected cause:	

Follow up action taken (if any):	

Comments:	

Date Closed: (dd/mm/yy)		**A.E:**	

Appendix IV Excursion Audit Form

Excursion Auditing Form

(for forest management herbicide use)

Company or Organization: _____ Date: _____

Representative: _____ Phone: _____

Address: _____ Page: ____ of ____

Treatment Year Audited: _____ Area Treated (ha): _____ Area Audited (ha): _____

Blocks Treated (#): _____ Blocks Audited (#): _____

Mgmt. Unit	Block	Category[1]	Off-Target Effects? None	Yes	Reported[2]
		Ra Ri Fo			
		Ra Ri Fo			
		Ra Ri Fo			

Appendix V Program Summary Report

Completed Treatments Report for Forest Management Herbicide

Company Name _____

Location _____

Date _____

Reported by _____

Only one entry per block per treatment type is allowed

Company Code[1]	Treatment Year	Disposition	Mgmt Unit	Block Number	Opening Number	Objective[2]	Area Total	Area Treated	Treatment Method[3]	Herbicide Tradename	PCP #	Rate[4]	Total Applied (L)

Completed Treatments Report for Forest Management Herbicide (Codes)

Footnote:

1.

ANC	Alberta Newsprint Co
APL	Alberta Plywood Ltd
BRL	Blue Ridge Lumber (1981) Ltd
CGP	Canadian Forest Products - Grande Prairie
CHC	Canadian Forest Products - Hines Creek
MDF	Manning Diversified Forest Products
MOS	Mostowich
MWB	Millar Western - Boyle
MWW	Millar Western - Whitecourt
NLD	Northland Forest Products
SEE	Seehta
SUN	Sundance Forest Products
SUP	Sunpine
THL	Tolko - High Level
VAN	Vanderwell
WDV	Weyerhaeuser - Drayton Valley
WED	Weyerhaeuser - Edson
WGP	Weyerhaeuser - Grande Prairie
WLD	Weldwood

ARC	Alberta Research Council
CFS	Canadian Forest Service
FGY	Foothills Growth & Yield Association
IFT	Incremental Forest Technologies
LFD	Land and Forest Division
UOA	University of Alberta

2.

ST	Stand Tending
SP	Site Preparation
CT	Crop Tree Thinning

3.

AD	Aerial broadcast (disk core or air induction)
AP	Aerial (AccuFlow or TVB)
HD	Aerial highlight (disk core or air induction)
HP	Aerial highlight (Accuflow or TVB)
BB	Backpack broadcast
BP	BP = Backpack patch
GB	Ground (mechanical) broadcast
RB	Basal (area based)
RS	RS = Basal (tree based)
SI	Stem injection
ST	Cut surface

Appendix VI Herbicide Proposal Requirement Checklist

REQUIREMENT	Met ✓ Incomplete X	COMMENTS
Company Experience (go-slow approach)		
Objectives (higher level plans – where applicable)		
Descriptions of Treatment Area-General Description		
Maps/aerial photos		
Wildlife considerations - provincial guidelines/mitigate measures		
Untreated leave strips		
Landscape planning (reforestation cover groups)		
Snag/unmerch tree protect		
Seasonal timing		
Riparian Management Zone		
Descriptions of Treatment Area-Individual Block Descriptions		
ARIS Opening Number		
Program Description Table		
Watercourses *Permanent/int-buffer requirements		
Watercourse special use approval		
Public Sensitive areas		
Competing vegetation/crop tree description		
Review of Alternatives Recommendations/justification (Biol/social/economical) / limitations of alternatives)		
Treatment Methodology		
Rates/timing/risk management		
Ground access-watercourse crossings/fish timing considerations		
Potential mixing/loading sites		
Public Involvement/Notification		
Monitoring Reporting Plan		
During operations		
Follow up for excursions		

Appendix VII **Treatment Inspection Sheet**

Treatment Inspection Sheet

Date of Inspection: _____

Service Registration No. _____:

Inspector: _____

District Office _____ **Inspector's phone number:** _____

SERVICE REGISTRATION INFORMATION:

Organization Name: _____

Address: _____

Individual Interviewed/Title: _____

Note: In the following sections a √ means the item meets requirements while an X means it is deficient

CERTIFICATE HOLDERS: Certificate Holders and Types (Note: for Forest Management Projects, a Forestry class Pesticide applicator certificate holder must be on site at all times)

Name	Certificate #	Class	Number of Assistants
1.			
2.			
3.			
4.			

COMMENTS: _____

_____

_____

APPLICATION EQUIPMENT: Application equipment description including Aircraft Call Numbers, nozzle type, number of nozzles:

MIXING AND LOADING SITE: Location: _____

Water source _____ Spill Kit – ER plan _____

Evidence of spillage _____ Evidence of off site movement _____

Emergency response information _____ Personal protective equipment _____

Spill cleanup material _____ Tankage

Anti-backflow or air separation on water

COMMENTS: _____

_____

SERVICE REGISTRATION/APPLICATOR RECORD KEEPING REQUIREMENTS:

Customer Name _____ Date/time _____

Application rate _____ Relative humidity _____

Precipitation _____ Wind speed/direction _____

Pest/purpose _____ Method of application _____

Temperature _____ Name of pesticide and PCP # _____

PERSONAL PROTECTIVE EQUIPMENT AND SPILL CLEANUP MATERIALS FOR STORAGE AND MIXING AND LOADING SITES

Neoprene or nitrile gloves _____ Coveralls _____

Neoprene or nitrile apron _____ Rubber boots _____

Eye protection _____ Respirator and cartridge _____

First aid kit _____ Neutralizing material _____

Container of clean water _____ Absorbant material

Broom _____ Eye wash at mixing site _____

Shovel _____ Blank labels _____

Waste container _____

Are herbicides being stored in a facility approved by the Pesticide Section? _____

Location of storage facility _____

PUBLIC NOTIFICATION

Immediately prior to an application, all main access routes shall be posted with signs advising that a pesticide application is in progress. The landowner or the owner's agent shall ensure that the signs remain in place for a minimum of 48 hours following the pesticide application, after which time the land owner or the owner's agent shall ensure the signs are removed.

- Signs posted prior to application
- Signs removed 48 hours after application
- Inspector's Signature
- Applicant Signature
- Printed Name

FAX COMPLETED FORM TO: Forest Management Branch – Provincial Herbicide Coordinator at (780) 427-0085.

Appendix VIII Post-Treatment Inspection Form

Inspector's name: _____ Location (legal land location if known): _____

Telephone number: _____ Leaseholder: _____

Region: _____

District office: _____ Applicator or contractor: _____

Date of Inspection: _____

1. Is there any evidence of offside movement?

   (a) Location & provide a description of type of offside movement and extent of damage? (i.e. spray drift; surface movement of residual herbicide, root uptake of herbicide, etc)

   (b) Description of damage to non-target vegetation (may include photos of damage area as well as symptoms of damage on vegetation)

2. Is there evidence of any impact from the herbicide application to any vegetation within 5 metres of water of an open body of water as defined in the Pesticide Regulations?

   (a) Location and type of open body of water (name of waterbody if know):

   (b) Distance (metres) sprayed from the bed and shore:

   Comments:

   (c) General comments of what vegetation is affected and extent.

3. Identify any other non-compliance to the *Environmental Code of Practice for Pesticides* or Pesticide Regulations that may have occurred and the type of violation (i.e.. pesticide spills, public safety, unregistered use, etc.)
(Forest Management Herbicide Applications Only)

4. Identify any non-compliance conditions in the letter of authorization issued to the holder of the timber disposition or the **Guidelines for the Use of Herbicides for Silviculture in Alberta** published by Sustainable Resource Development.

(Industrial Herbicide Applications Only)

5. Is there any overheight woody plant sprayed on a right-of-way:

   (a) location:

   (b) adjacent to numbered highway:
   (30% of target vegetation cannot be over 1.5 metres) yes/no

   (c) adjacent to a road:
   (30% of target vegetation can not be over 2.5 metres) yes/no

   (d) cross-country rights-of-way:
   (30% of target vegetation can not be over 4.0 metres). yes/no

6. Has blanket treatment occurred where not warranted? (On rights-of-way where the target vegetation species covers less than 30%, herbicide applications shall be conducted on a selective spot treatment basis. Vegetation management practises to encourage the growth of low growing shrubs on the edges of the right-of-way shall be followed unless these species pose a danger to the operation or maintenance of the right-of-way).

   (a) Description of area and location

Please fax completed form to: Forest Management Branch – Provincial Herbicide Coordinator at (780) 427-0085.

Appendix IX **Common Causes of Herbicide damage, Natural Stress and Injury Symptoms**

Causes of Herbicide Damage

Rain shortly after application: Leaching or run-off through soil will be particularly hazardous if heavy rains occur immediately after application.

Inattention to soil characteristics and soil water movement: The potential for various herbicides to move with soil water, particularly in coarse textured soils, is frequently underestimated.

Inadequate buffers: The potential for herbicide movement and for root growth into treated areas is frequently underestimated.

The use of systemic herbicides on tree and shrub "suckers": A number of tree and shrub species reproduce by developing new stems from the roots of a parent plant. These new stems are referred to as "suckers" and they can be seen around the base of a number of trees and shrub species including various poplar, lilac, and Manitoba maples. Using systemic herbicides to control plant suckers can result in herbicide translocation and subsequent damage to parent tree or shrub.

Natural Stress Symptoms

Since plants are seldom grown in conditions where life support factors are ideal, an imbalance may induce stress which results in visible symptoms.

Stress symptoms can be caused by drought, winter dying, flooding, natural senescence, frost, high temperatures nutrient deficiency, and diseases. The symptoms associated with these natural stress factors may be easily mistaken for herbicide damage.

Typical Herbicide Injury Symptoms

Herbicide injury in a field often display a distinct pattern while other trees nearby are perfectly healthy. Although herbicide effects on plants vary, related compounds usually cause plants to show a characteristic group of symptoms.

Injury Symptoms on Leaves

Feathering of leaves: This symptom is typical of leaf malformations induced by translocated growth hormone herbicides such as 2,4-D, MCPA, dicamba, triclopyr and sometimes glyphosate.

Fiddleheading: This pronounced symptom occurs in young growing points of plants. An upward curling of older leaves is also obvious. Such symptoms are produced by growth hormone

herbicides such as dicamba and picloram.

Cupping of leaves: A distinct cupping (usually upward) is typical of injury from growth hormone herbicides such as dicamba and picloram.

Chlorosis: One of the more typical injury symptoms of herbicides is the loss of chlorophyll from leaf tissue resulting in many patterns.

Meristematic chlorosis: Chlorosis, which initially occurs in the meristematic regions (growing points) of plants is typical of translocated herbicides such as amitrole, glyphosate or chlorosulfuron. The chlorotic areas may appear almost yellow, white or pinkish in colour.

Veinal chlorosis: Yellowing in the veins of the leaves. This typical injury is caused by triazine herbicides e.g. atrazine, and results from root uptake of the herbicides.

Marginal chlorosis: This symptom occurs as a narrow yellow band almost entirely around the leaf margin. It is sometimes called the "halo effect". This symptom can occur from foliar uptake of triazine herbicides.

Mottling: This refers to chlorosis which occurs randomly on the leaf. Parts of the leaf remain green whereas others become chlorotic. Injury occurs only on leaves that came in contact with the spray; new leaves that develop afterward appear normal. Contact herbicides such as diquat or paraquate may cause such symptoms.

Necrosis: Death of isolated tissue. It usually follows chlorosis.

Injury Symptoms on the Stems

Epinasty: This term describes the bending and twisting that occurs in either stem or petioles of the plants. The response occurs within a few hours after exposure to a Group 4 herbicide.

Abnormal stem elongation: Stem elongation of broadleaved plants may be enhance (at low concentrations) or inhibited (at high concentrations) by growth-hormone herbicides such as 2,4-D, MCPA, dicamba and picloram.

Diagnosis of Herbicide Injury and Damage

Making an accurate diagnosis of herbicide injury is often difficult if an investigator looks at specimens of dying plants. For this reason, the investigator should actually view the affected non-target vegetation as soon as possible after the damage is reported and should consider the following points:

Do not make a snap judgement: It is important to gather all possible evidence (plant and/or soil specimens, photographs) and pertinent information before drawing conclusions.

Ask a lot of questions pertaining to:

(a) Spraying details such as chemicals sprayed, the date of spraying, method of application,
(b) Date of spraying,
(c) Weather conditions before and after spraying,
(d) Soil conditions (sandy soil may increases soil mobility of certain persistent herbicides).

Look for patterns such as:

(a) Condition of unaffected surrounding vegetation
(b) Symptoms of disease or insect
(c) Injury pattern (strips, drift pattern)

Watch for look-alike symptoms. These may include:

(a) Nutrient deficiencies
(b) Insect or disease damage
(c) Weather related injuries

Post Treatment Inspection Form

The main objective of the post treatment inspection is to identify any incidents of herbicide movement (whether through air or ground) off the approved treatment site and to ensure that there is no visible impact from the herbicide within 5 metres of an open body of water (when herbicides listed in the Environmental Code of Practice are used for forest management.)

The holder of the Timber Disposition is obligated to monitor treatment areas and identify any occurrences off the treatment site and to report these incidents to the nearest regional Environmental Assurance Service office. A forest officer may notice areas of herbicide excursions that may or may not have been reported. It is important to notify the nearest regional Environmental Assurance Service office of any treatment areas of which you may have concern, so the appropriate action may be taken.

The degrees of herbicide excursions will vary. If long stretches of vegetation are affected or a water buffer violation has occurred then compliance action may be a consideration. If the incident is severe, the area may be re-inspected and the nearest regional Environmental Assurance Service office may request the Public Lands and Forests Officer to attend a joint follow-up inspection (along with pesticide applicator, lease holder, etc.). During the inspection, vegetation samples would be taken of affected vegetation for chemical analysis and a determination may be made in respect to what compliance action would be appropriate.

A post-treatment inspection form can be found in Appendix VIII and may assist the Forest officer in reporting any pesticide excursions.